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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/336,525	06/18/1999	JUDY HUANG	AMAT/3577.X1/PD	7748

32588 7590 04/18/2003

APPLIED MATERIALS, INC.
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SANTA CLARA, CA 95050

EXAMINER

PADGETT, MARIANNE L

ART UNIT	PAPER NUMBER
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1762

21

DATE MAILED: 04/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/336,525

Applicant(s)

Judy Huang

Examiner

M.L. Pulett

Group Art Unit

1702

— The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address —

P riod for R ply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☒ Responsive to communication(s) filed on 12/30/02 + 2/5/03
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 24-26, 28, 30-38, 40, 42-45 + 48 is/are pending in the application.
- Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 24-26, 28, 30-38, 40, 42-45 + 48 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☐ All ☐ Some* ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 17
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☒ Interview Summary, PTO-413 20
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Other _____

Office Action Summary

Art Unit: 1762

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/05/03 has been entered.

As noted in the 2/24/02 telephone interview, the after final amendment of 12/17/02 will be entered in place of the non-existent 1/5/03 amendment requested in the RCE Transmittal.

2. Claim 45 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

✓ Claim 45 has been amended to include the limitation of "as detected by a fourier transform infrared analysis", and claim 45 depends from 34, which indicates that the layer being inert gas plasma treated (and analyzed) is either SiCOH or SiC. The only support for the FTIR limitations was found on page 6, line 20- page 7, line 15, where only SiC was said to have been analyzed via FTIR, and all discussion of Si-O or C-O bonds is associated with the alternate plasma treatment with N₂O gas. This would appear to indicate that as amended, claim 45 contains New Matter, especially as -O, -H and -OH do not have the same chemistry as Si and C, hence one cannot provide support for their behavior from deposits of only Si and C. It is further noted that the following (page 7-8) Ex. 1 does not use FTIR analysis, and its sample analysis as shown in tables 3 (O, but no H present) or Table 4 (C-H present, but negligible O in C-O), also does not concern the claimed SiCOH. Therefore, no direct or inferred basis for the claimed results of FTIR analysis on SiCOH was found, so unless shown to be supported, claim 45 is considered to contain New Matter.

Art Unit: 1762

3. Claims 24-26, 28, 30-38, 40 and 42-45 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification was reviewed for support for depositing a layer "comprising silicon" (i.e. any compound with any amount of Si from pure Si to metal silicides, to Si oxides, etc.), on "organic polymeric material, α C, α FC, SiCOH or SiC", which have been exposed to a plasma containing essentially only inert gas. Applicants cited no support.

The summary on page 2, teaches SiC exposed to inert gas plasmas, or O-containing, such as N_2O plasmas; where the other claimed layers may be similarly plasma treated, but no disclosure on any particular type of second layer deposits, is included here. Table 1 provides the plasma conditions, not layer treated, nor post-treatment deposit; while Table 2 is for N_2O plasma, and not relevant to the present claims. Page 5 indicates either plasma can be used to treat the layers of claim 24, but does not discuss subsequent deposits, with page 6-7 and the example directed to SiC with plasma treatment only.

What exactly is deposited and when, in Ex. 2 (pages 9-10), is not very clear, however there is no explicit disclosure of any Si-containing layer deposit on He-plasma treated SiC, the only claimed layer discussed therein. Ex. 3 is also directed solely to the silicon carbide layers species, and to N_2O -plasma treatment (so page 10 is not relevant to the claims) and He-plasma (page 11), where undoped silicon glass (USG, an oxide), was deposited on the treated SiC. Example 4 contains like relevant disclosure as Ex. 3, with page 11, line 31-page 12, line 13 directed to He-plasma. Supports only USG on SiC.

Page 12, lines 14-21, has unspecific generic teachings to other layers or other dielectrics, but is specifically directed to several layers of SiC, where the layers maybe exposed

Art Unit: 1762

to the treatment [He] plasma. This might support SiC on SiC. The metal layer and reducing agent plasma are not relevant to claims.

Page 13, line 6-15, disclose SiC, plasma treated [He or N₂O], then deposited thereon by a dielectric layer that maybe USG, fluorine-doped silicon glass (FSG) or other silicon-carbon-oxygen based materials. No other layers are suggested for treatment, and lines 25⁺ discuss deposition of a photoresist of unspecified material on a SiC ARC layer, hence is not relevant.

No other disclosure of the broad limitation of any Si-containing layer on claimed He-plasma treated layers were found, hence these claims contain New Matter.

4. Claim 45 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for FTIR analysis of SiC, does not reasonably provide enablement for FTIR analysis of SiCOH with substantially no change in composition. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. See section 2 above.

5. Claims 24-26, 28, 30-38, 40 and 42-45 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for deposition of USG, FSG or silicon-carbon-oxygen based dielectrics, and probably SiC, deposited on He-plasma treated SiC, does not reasonably provide enablement for the broader claimed "a second layer comprising silicon", nor deposition of any of these layers on organic polymeric materials, α C, α FC or SiCOH. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. See the above discussion in section 3. Note for independent claim 34, only the SiCOH is relevant, and where SiC is specifically claimed only the broadness of the "comprising" Si is relevant.

Art Unit: 1762

6. Applicant's have amended independent claims 24 and 34 to specify that the second layer "comprise silicon", hence differentiating from the rejection of Nguyen et al (935) in view of Itoh et al, where the second layer is a fluorocarbon film. Similarly, the rejection of Nguyen et al (935), in view of Tanabe et al, reads on substrate (Si) /SiC/ carbonaceous layers (DLC or CF), but not the last layer being Si-containing as now claimed, thus removing this rejection over the art for all but claim 48.

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 24, 26, 31, 34-36, 38, 43 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori as discussed in section 7 of paper No. 15, in view of Park et al.

As previously discussed, Mori discloses first layers as claimed, that may be plasma treated with an inert gas, commensurate in scope with the broad claims. While Mori's process may be a preparation for further processing (col. 1, lines 5-50, esp. 40-50), Mori does not specify any particular successive coating operations as necessary or explicitly, but do contemplate use in further production of semi-conductor or liquid crystal devices.

Park et al teach deposition of dielectric materials, such as O₃-TEOS oxides on under-laying dielectric layers in forming semiconductor devices, hence supplying motivation for depositing a Si-containing layer on Mori's treated layer, since Park et al's use of the initial dielectric is commensurate in scope with Mori's suggested end uses. Furthermore, Park et al provides additional reasons to inert gas (Ar) plasma treat Mori's dielectric layer made of organic polymer, or SOG spin-on-glass, which for the organic SOG's reads on applicants' first layer,

Art Unit: 1762

because Park et al treats the first dielectric (with or without conductive wire patterning) with plasma that may be exclusively Ar, in order to provide the surface with charge polarity (but no compositional change), then in the same chamber deposits the O₃-TEOS or O₃-HMDS oxides on the exposed treated surfaces of the first dielectric material. It would have been further obvious that Park et al's process would have been expected to be effective on Mori's coated (and treated) substrates, because Park et al's technique is directed to generic dielectric material for the first or underlaying layer, and both references are intended and suggested for use in any semi-conductor manufacturing processes, with their advantages (Mori-reduced dust and debris production; and Park-increased deposition rate, planarization and simplified process steps) expected to have been effective in either case. In Park et al, see the abstract; figures 5-8; col. 3, lines 36-64 (prior art processes with multiple dielectrics, with intervening Ar plasma and O₃-TEOS deposit following); col. 4, lines 15-68; col. 5, lines 45-55; col. 6, lines 23-45 and 55-68; col. 7, lines 12-45⁺; col. 8, lines 11-30 and claims 1-3 and 6-8. Note, while plasma parameters for the Ar plasma were not given, similar conditions to those of the specifically exemplified N₂+NH₃ plasma would have been expected, as the purpose of the plasma is not chemical reaction, but surface charging. Thus for Ar, optimization starting from flow rates of 2,280 ccm, pressure of 2.5 torr, and power of 400 watts would have been expected. Also note that like treatment of like materials would inherently produce the same properties, thus oxygen resistance would have inherently increased.

9. Claims 24-26, 28, 30-38, 40, 42-45 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al (935) as discussed in section 6 & 8 of Paper No. 15, in view of Tanabe et al as discussed in Section 8 of Paper No. 15, and further in view of Goel et al.

As noted above, the Si substrate/SiC/carbonaceous (diamond) layer sequence suggested by combination of Nguyen et al and Tanabe et al does not have any Si in the second

Art Unit: 1762

layer, however Goel et al teach a diamond-like nanostructure that is a mixture of C, O, Si and H, where the advantage is that C-H and Si-O networks included therein stabilize the structure.

Goel et al's deposits are intended to be used as an outer coating on an interlayer that may be SiC (abstract; figure 1; col. 4, lines 5-67⁺). It would have been obvious to employ such coating for the Tanabe et al carbonaceous layer, and Nguyen dielectric, as the composition, non-doped is still of insulating materials, and the stability supplied by the network structures would have been advantageous for reducing stress.

10. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al in view of Tanabe et al as applied in Paper No. 15, section 8, as there is no requirement for a second layer, let alone one containing Si in this claim, so arguments concerning such limitations are not relevant.

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 24-26, 28, 30-38, 40, 42-45 and 48 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3-5, 8, 10-11, 13-15, 18-22, 24-24 (as published in 2002/0016085A1) of copending Application No.09/902,518. Although the conflicting claims are not identical, they are not patentably distinct from each other because these claims contain overlapping materials and treatments, but claimed in different orders, with both reading on the first layer being SiC and the

Art Unit: 1762

second layer being Si-containing, where the plasma treatment of the first many use inert gases, such as He. The examiner notes that the application of the publication 2002/00616085 A1 cited by applicants, was allowed, but as it is presently unavailable (Off. Publication), the actual claims that were allowed cannot be compared to the present claims in this application, and if the allowed claims are patentably significantly different than the present claims this rejection will be remove.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

13. Claims 24-26, 28, 31-38, 40, 43-45 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al in view of Mase et al.

Park et al is discussed above, and only differences from applicants' claims is not specifying a specific under laying dielectric material that explicitly reads on applicants selection of first layers, such as SiC. Mase et al is teaching an analogous process where multi-layer dielectric are employed, and discloses a wider variety of useful dielectric materials, particularly noting the use of polyimides or SiC as under laying or first dielectrics and depositing thereover various Si-containing layers including silicon nitride or PSG (phosphosilicate glass), hence it would have been obvious to one of ordinary skill in the art, that useful dielectrics for Park et al's under laying generically taught dielectrics layers would also include material such as SiC, because it has been shown to be a desirable dielectric material, on which other dielectrics (Si-containing) are desired to be deposited, and Park's charging technique would have been expected to be equally effective and necessary to achieve the taught advantages when using the SiC suggested by Mase et al. In Mase et al, see the abstract; col. 3, lines 36-43 & claim 4.

14. Applicant's arguments filed 12/30/02 and discussed above have been fully considered but they are not persuasive.

Art Unit: 1762

Applicant's arguments with respect to claims 24-26, 28, 30-38, 40, 42-45 and 48 have been considered but are moot in view of the new ground(s) of rejection.

15. Any inquiry concerning this communication from the examiner should be directed to M. L. Padgett whose telephone number is (703) 308-2336. The examiner can generally be reached on Monday-Friday from about 8:30 a.m. to 4:30 p.m.; and fax phone numbers are (703) 872-9310 (regular); (703) 872-9311 (after final); and (703) 305-6078 (unofficial).

M.L. Padgett/dh 4/11/03
April 15, 2003

A handwritten signature in cursive script, appearing to read "Marianne L. Padgett", written in black ink.

MARIANNE PADGETT
PRIMARY EXAMINER